

CLAIMS

What is claimed is:

1. An aft FLADE gas turbine engine comprising:
 - a fan section drivenly connected to a low pressure turbine section,
 - 5 a core engine located between the fan section and the low pressure turbine section,
 - a fan bypass duct circumscribing the core engine and in fluid communication with the fan section,
 - 10 a mixer downstream of the low pressure turbine section and in fluid communication with the fan bypass duct,
 - an aft FLADE turbine downstream of the mixer,
 - at least one row of aft FLADE fan blades
 - 15 disposed radially outwardly of and connected to the aft FLADE turbine, and
 - the row of FLADE fan blades radially extending across a FLADE duct circumscribing the fan section.
 2. An engine as claimed in claim 1 further comprising:
 - a fan inlet to the fan section,
 - an annular FLADE inlet to the FLADE duct, and
 - the FLADE inlet is axially located substantially aftwardly of the fan section.
 - 25 3. An engine as claimed in claim 2 wherein the FLADE inlet is axially located aftwardly of the core engine.
 4. An engine as claimed in claim 1 further comprising the aft FLADE turbine connected to and rotatable with a low pressure turbine of the low

pressure turbine section.

5. An engine as claimed in claim 4 further comprising:

a fan inlet to the fan section,

an annular FLADE inlet to the FLADE duct, and

the FLADE inlet is axially located substantially aftwardly of the fan section.

10. An engine as claimed in claim 5 wherein the FLADE inlet is axially located aftwardly of the core engine.

7. An engine as claimed in claim 1 wherein the aft FLADE turbine is a free turbine.

15. An engine as claimed in claim 7 further comprising:

a fan inlet to the fan section,

an annular FLADE inlet to the FLADE duct, and

the FLADE inlet is axially located substantially axially aftwardly of the fan section.

20. An engine as claimed in claim 8 wherein the FLADE inlet is located axially aftwardly of the core engine.

25. An engine as claimed in claim 1 further comprising at least one power extraction apparatus disposed within the engine and drivenly connected to the aft FLADE turbine.

11. An engine as claimed in claim 10 wherein the power extraction apparatus is an electrical generator.

12. An engine as claimed in claim 11 wherein the electrical generator is drivenly connected through a speed increasing gearbox to the aft FLADE turbine.

5 13. An engine as claimed in claim 10 wherein the power extraction apparatus is a power takeoff assembly including a housing within which is a power takeoff shaft drivenly connected to the aft FLADE turbine through a right angle gearbox.

10 14. An engine as claimed in claim 10 wherein the power extraction apparatus is disposed within a hollow engine nozzle centerbody of the engine located aft and downstream of the aft FLADE turbine.

15 15. An engine as claimed in claim 14 wherein the power extraction apparatus is an electrical generator disposed within the hollow engine nozzle centerbody.

16. An engine as claimed in claim 17 wherein the electrical generator is drivenly connected through a speed increasing gearbox to the aft FLADE turbine.

20 17. An engine as claimed in claim 14 wherein the power extraction apparatus is a power takeoff assembly including a housing disposed within the hollow engine nozzle centerbody and within which is a power takeoff shaft drivenly connected to the aft FLADE turbine through a right angle gearbox.

25 18. An engine as claimed in claim 1 further comprising a row of variable first FLADE vanes radially extending across the FLADE duct axially forwardly of the row of FLADE fan blades.

19. An engine as claimed in claim 18 further comprising:

a fan inlet to the fan section,

an annular FLADE inlet to the FLADE duct, and

the FLADE inlet is axially located substantially aftwardly of the fan section.

5 20. An engine as claimed in claim 19 wherein the FLADE inlet is axially located aftwardly of the core engine.

10 21. An engine as claimed in claim 18 further comprising the aft FLADE turbine connected to and rotatable with a low pressure turbine of the low pressure turbine section.

15 22. An engine as claimed in claim 21 further comprising:

a fan inlet to the fan section,

an annular FLADE inlet to the FLADE duct, and

the FLADE inlet is axially located substantially aftwardly of the fan section.

20 23. An engine as claimed in claim 22 wherein the FLADE inlet is axially located aftwardly of the core engine.

24. An engine as claimed in claim 18 wherein the aft FLADE turbine is a free turbine.

25 25. An engine as claimed in claim 24 further comprising:

a fan inlet to the fan section,

an annular FLADE inlet to the FLADE duct, and

the FLADE inlet is axially located substantially axially aftwardly of the fan section.

26. An engine as claimed in claim 25 wherein the FLADE inlet is located axially aftwardly of the core engine.

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27. An engine as claimed in claim 18 further comprising at least one power extraction apparatus disposed within the engine and drivenly connected to the aft FLADE turbine.

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28. An engine as claimed in claim 27 wherein the power extraction apparatus is an electrical generator.

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29. An engine as claimed in claim 28 wherein the electrical generator is drivenly connected through a speed increasing gearbox to the aft FLADE turbine.

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30. An engine as claimed in claim 27 wherein the power extraction apparatus is a power takeoff assembly including a housing within which is a power takeoff shaft drivenly connected to the aft FLADE turbine through a right angle gearbox.

31. An engine as claimed in claim 27 wherein the power extraction apparatus is disposed within a hollow engine nozzle centerbody of the engine located aft and downstream of the aft FLADE turbine.

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32. An engine as claimed in claim 18 further comprising a variable area turbine nozzle with variable turbine nozzle vanes located aft and downstream of the mixer and the low pressure turbine.

33. An engine as claimed in claim 18 further comprising:

a variable throat area engine nozzle downstream and axially aft of the mixer and the fan bypass duct,

5 a plurality of circumferentially disposed hollow struts in fluid flow communication with the FLADE duct, and

10 a substantially hollow centerbody supported by and in fluid flow communication with the hollow struts.

15 34. An engine as claimed in claim 33 further comprising cooling apertures in the centerbody and in a wall of the engine nozzle wherein the cooling apertures are in fluid communication with the FLADE duct.

20 35. An engine as claimed in claim 34 further comprising a variable area FLADE air nozzle including an axially translatable plug within the hollow centerbody and a radially outwardly positioned fixed nozzle cowling of the centerbody.

36. An engine as claimed in claim 33 further comprising:

aft thrust augmenting afterburners located aft and downstream of the aft FLADE turbine,

25 cooling apertures in the centerbody and in a wall located downstream of a throat area of the engine nozzle, and

the cooling apertures being in fluid communication with the FLADE duct.

37. An engine as claimed in claim 33 further comprising a forward afterburner axially disposed between the mixer and the aft FLADE turbine.

38. An aircraft comprising:

5 an aft FLADE gas turbine engine within a fuselage of the aircraft,

 the gas turbine engine comprising;

10 a fan section drivenly connected to a low pressure turbine section,

 a core engine located between the fan section and the low pressure turbine section,

15 a fan bypass duct circumscribing the core engine and in fluid communication with the fan section,

 a mixer downstream of the low pressure turbine section and in fluid communication with the fan bypass duct,

20 an aft FLADE turbine downstream of the mixer,

 at least one row of aft FLADE fan blades disposed radially outwardly of and connected to the aft FLADE turbine, and

 the row of FLADE fan blades radially extending across a FLADE duct circumscribing the fan section.

39. An aircraft as claimed in claim 38 further comprising:

25 a fan inlet to the fan section,

 an annular FLADE inlet to the FLADE duct, and

 the FLADE inlet is axially located substantially aftwardly of the fan section.

40. An aircraft as claimed in claim 39 wherein the 30 FLADE inlet is axially located aftwardly of the core engine.

41. An aircraft as claimed in claim 39 further comprising:

FLADE air intakes and an engine air intake mounted flush with respect to the fuselage,

5 the FLADE air intakes axially offset from the engine air intake,

the engine air intake connected to and in fluid communication with the fan inlet by an engine fixed inlet duct, and

10 the FLADE air intakes connected to and in fluid communication with the FLADE inlets by FLADE fixed inlet ducts.

42. An aircraft as claimed in claim 41 further comprising:

15 inlet duct passages of the engine and FLADE fixed inlet ducts respectively being two-dimensional and terminating in transition sections between the inlet duct passages and the fan and FLADE inlets respectively.

20 43. An aircraft as claimed in claim 42 further comprising a power extraction apparatus disposed within the engine and drivenly connected to the aft FLADE turbine.

25 44. An aircraft as claimed in claim 43 wherein the power extraction apparatus is an electrical generator.

45. An aircraft as claimed in claim 44 wherein the electrical generator is drivenly connected through a speed increasing gearbox to the aft FLADE turbine.

5 46. An aircraft as claimed in claim 43 wherein the power extraction apparatus is a power takeoff assembly including a housing and a power takeoff shaft drivenly connected to the aft FLADE turbine through a right angle gearbox within the housing.

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47. An engine as claimed in claim 42 further comprising forward and aft electrical generators disposed within the engine forward and aft of the aft FLADE turbine and drivenly connected through forward and aft speed increasing gearboxes respectively to the aft FLADE turbine.

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48. An aircraft as claimed in claim 41 further comprising:

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at least one FLADE air exhaust duct leading from the FLADE duct to at least one FLADE exhaust nozzle offset from an engine nozzle downstream and axially aft of the mixer and the fan bypass duct,

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an aircraft waste heat cooling system having an aircraft waste heat source within the aircraft, and a heat exchanger disposed in the FLADE air exhaust duct and in fluid heat exchange relationship with the aircraft waste heat cooling system.

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49. An engine as claimed in claim 1 further comprising forward and aft electrical generators disposed within the engine forward and aft of the aft FLADE turbine and drivenly connected through forward and aft speed increasing gearboxes respectively to the aft FLADE turbine.

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50. An engine as claimed in claim 18 further comprising forward and aft electrical generators disposed within the engine forward and aft of the aft

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FLADE turbine and drivenly connected through forward and aft speed increasing gearboxes respectively to the aft FLADE turbine.

5 51. An engine as claimed in claim 18 further comprising a fixed throat area engine nozzle downstream and axially aft of the mixer and the fan bypass duct.

10 52. An engine as claimed in claim 51 further comprising at least one power extraction apparatus disposed within the engine and drivenly connected to the aft FLADE turbine.

15 53. An engine as claimed in claim 52 wherein the power extraction apparatus is an electrical generator drivenly connected through a speed increasing gearbox to the aft FLADE turbine.

20 54. An engine as claimed in claim 52 wherein the power extraction apparatus is a power takeoff assembly including a housing within which is a power takeoff shaft drivenly connected to the aft FLADE turbine through a right angle gearbox.